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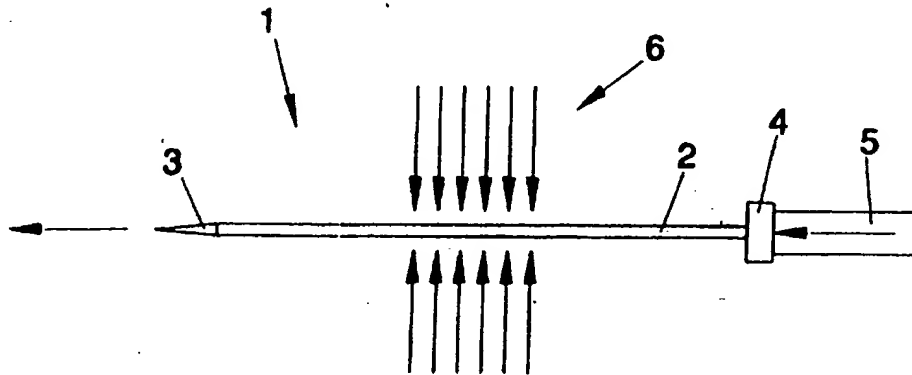
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(54) Title: A METHOD AND MEANS FOR HOT-AIR CUTTING



(57) Abstract

A method for hot-air cutting wherein compressed air is forced into a hot-air unit (2) in which the compressed air is heated, whereafter the air is conducted out through a cutting nozzle (3) in the form of hot air and a device for hot-air cutting, wherein a compressed-air unit is connected to a hot-air unit (2) via a coupling device arranged at one end of the hot-air unit (2) to provide the hot-air unit (2) with compressed air, the hot-air unit (2) being provided at its other end with a cutting nozzle (3), and also wherein a heating device (6) is arranged to heat air flowing into the hot-air unit (2).

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A method and means for hot-air cutting

TECHNICAL FIELD:

The present invention relates to cutting and working technology using
5 hot air.

BACKGROUND ART:

Previously known methods for cutting various types of plastics such as
foam plastic, moulded plastic and other porous materials such as
10 textiles use laser technology which has the drawback that the material
is burned. Ultrasound is also used to cut these types of material but has
the drawback of being imprecise and "spongy". High-pressure water
jets are also used for cutting textiles but produce a messy edge.
Electronic beam working also occurs in which electrons are thrown out
15 from a cathode consisting of a tungsten wire, through a hole in an
anode, subsequently adjusted magnetically and then concentrated by a
magnetic lens. A working temperature of about 6000°C is reached with
this technology and electronic beam working is an unnecessarily
complicated technology for the materials for which the present
20 invention is suitable.

OBJECT OF THE INVENTION:

The object of the present invention is to provide a method and a device
for cutting and, to a certain extent, also working porous material such
25 as foam plastic, moulded plastic and textiles, said method solving the
problems of previously known methods and being simple, inexpensive
and reliable.

SUMMARY OF THE INVENTION:

30 Using compressed air which is forced into a heated tubular channel
provides a hot-air jet which is forced out of a cutting nozzle at high
pressure, this hot-air jet being used to cut and, to a certain extent work
porous material such as foam plastic, moulded plastic and textiles.

BRIEF DESCRIPTION OF THE DRAWINGS:

The invention will now be described in more detail with reference to the accompanying drawings.

5 Figure 1 shows a basic diagram of a device and a method according to the present invention.

Figure 2 shows a section through a device with inductive heating according to the present invention.

10 Figure 3 shows a section through a device with electric heating according to the present invention.

DESCRIPTION OF THE INVENTION:

Figure 1 illustrates the principle of the present invention in which a cutting tool 1 comprising a hot-air unit 2 is provided at one end with
15 a cutting nozzle 3. The hot-air unit 2 is provided at its other end with a coupling device 4 arranged to connect a compressed-air hose 5 to the hot-air unit 2. When the compressed-air hose 5 has been connected to the hot-air unit 2 compressed air can flow into the hot-air unit 2, through this and out through the cutting nozzle 3, as indicated by
20 arrows in Figures 1-3. A heating device 6 is also arranged in connection with the hot-air unit 2 in order to heat the air in the unit. In the embodiment of the invention illustrated in Figure 1, the arrows directed at right angles to the hot-air unit 2 may be represented by a burner, not shown, which heats the hot-air unit with an open flame.

25 The range for the operating pressure out through the cutting nozzles is 1-100 bar, depending on the material to be cut. The pressure of the air entering the hot-air unit 2 may be 6-20 bar, for instance, whereas the pressure out through the cutting nozzle will be in the order of 50 bar.
30 The heating device 6 is arranged to heat the air flowing into the hot-air unit 2 to a temperature which can be set depending on the material to be cut or worked. For foam plastic, for instance, a temperature of about 200°C is used and for moulded plastic a temperature of about 1000°C.

The cutting nozzle 3 is detachably connected to the hot-air unit 2 so that it can be replaced with a different nozzle particularly suited to textiles, for instance, or in the case of damage or wear.

5 According to one embodiment of the invention shown in Figure 2, the heating device 6 is in the form of an inductive heater, placed on the heating section 7 of a certain stretch along the hot-air unit 2. Upon inductive heating the heating section 7 is enclosed by an inductive
10 heater 8 in the form of a coil supplied with high-frequency alternating current. The frequency of the current is chosen depending on the heating desired. If the frequency is increased, heating will be concentrated to the layer closest to the outer surface of the heating section 7, whereas a lower frequency will produce heating further into the material. The heating is obtained by a rapidly alternating magnetic
15 field which passes through the heating portion 7 and produces eddy currents in the material. The current losses heat the hot-air unit 2 and the air therein. An embodiment in which the heating section 7 is removed is also feasible within the scope of the invention. The high-frequency alternating current is produced in generators operating in the
20 frequency range 4-30 Mp/s for power factors up to 100 kW.

Figure 3 shows another embodiment in which the hot-air unit 2 is in the form of a coil, in which case the heating device 6 consists of a resistive electric heater 9.

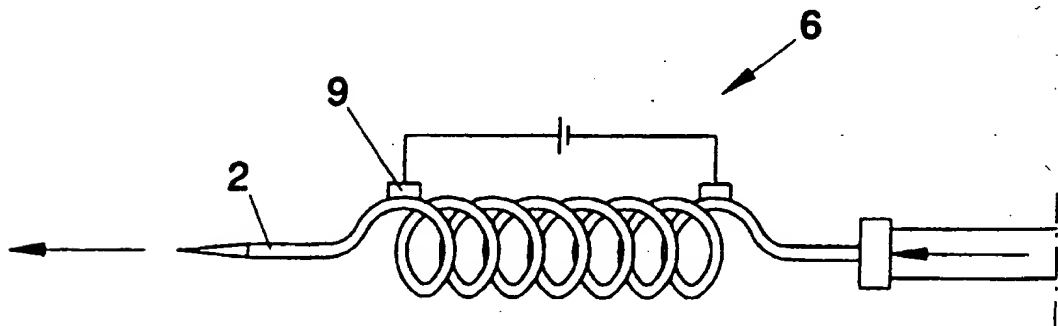
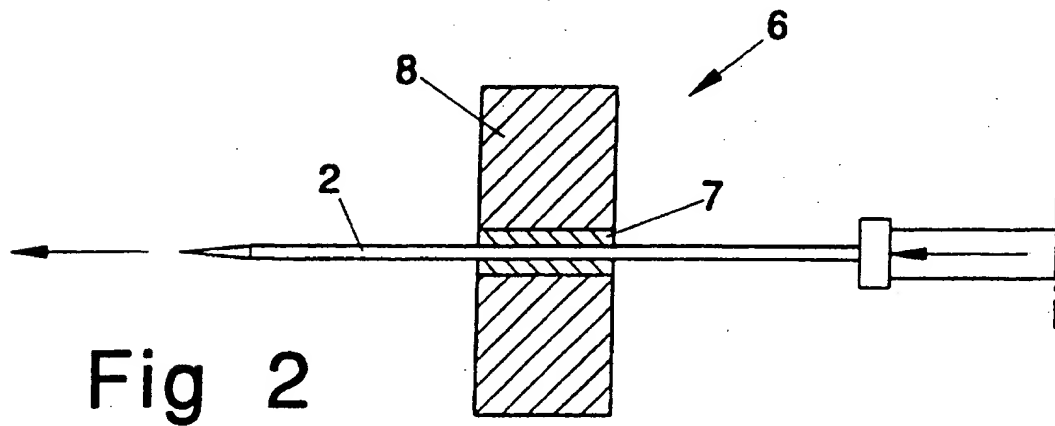
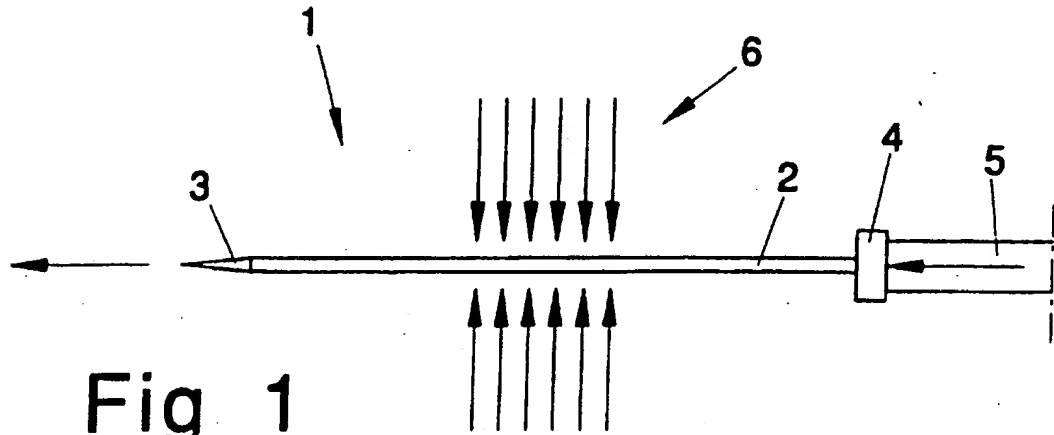
25 In all the embodiments described above, the hot-air unit 2 is shaped as a cylindrical tube of acid-proof steel having uniform diameter along its axial extension. Its cutting nozzle has an out-flow opening with a diameter of approximately 0.01 - 2.00 mm, i.e. equivalent to a gas
30 welding nozzle.

The hot-air unit can be shaped in several advantageous ways within the scope of the following claims, e.g. with varying diameter in order to achieve a different degree of compression on the nozzle side.

CLAIMS

1. A method for hot-air cutting, characterized in that compressed air is forced into a cylindrical hot-air unit (2) in
5 which the compressed air is heated, whereafter the air is conducted out in the form of hot air through a cutting nozzle (3) which has an outflow opening with a diameter of 0.01 - 2.00 mm..
2. A method as claimed in claim 1, characterized in
10 that the hot-air unit (2) is heated by directly heating an area of the hot-air unit (2) with a burner.
3. A method as claimed in claim 1, characterized in
15 that the hot-air unit (2) is heated by heating an area of the hot-air unit (2) with an inductive heater (8).
4. A method as claimed in claim 1, characterized in
that a heating section is heated by means of electric heating.
- 20 5. A device for hot-air cutting, characterized in that a compressed-air unit is connected to a cylindrical hot-air unit (2) via a coupling device arranged at one end of the hot-air unit (2) to provide the hot-air unit (2) with compressed air and that the hot-air unit (2) is
25 provided at its other end with a cutting nozzle (3) having an outflow opening with a diameter of 0.01 - 2.00 mm, and also that a heating device (6) is arranged to heat air flowing into the hot-air unit (2).
6. A device as claimed in claim 5, characterized in
that the heating device (6) comprises a burner.
30
7. A device as claimed in claim 5, characterized in
that the heating device (6) comprises an inductive heater (8).
8. A device as claimed in claim 5, characterized in
35 that the heating device (6) comprises an electric heater (9).

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A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B26F 1/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B26F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 2508064 B (UNION CARBIDE CORP), 4 Sept 1975 (04.09.75) --	1-8
A	GB 851473 A (THE KENDALL COMPANY), 19 October 1960 (19.10.60) -----	1-8

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